

Fruits and Vegetables Offered in School Lunch Salad Bars Versus Traditional School Lunches

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Most U.S. school-age children do not eat enough fruits and vegetables, both in terms of the number of servings and variety. One proposed way to improve children's consumption of fruits and vegetables is to increase the number of schools that offer salad bars as part of the National School Lunch Program. This study presented the first analysis of nationally representative data on foods offered in school lunch salad bars. The data were collected during the 1998-99 school year as part of USDA's School Nutrition Dietary Assessment Study-II. The study presented here examined whether schools with salad bars offered a greater variety of fruits and vegetables than did schools without salad bars. The study also examined items other than fruits and vegetables that were commonly offered in school lunch salad bars, with a focus on dietary fat content. Results showed that salad bars were associated with a greater variety of fruit and vegetable offerings. Schools with salad bars were much more likely to serve lettuce, tomatoes, other raw vegetables, and fresh fruit than were schools without salad bars. In addition, schools with salad bars were more likely than their counterparts, to offer nutrient-dense vegetables (like carrots and broccoli).

School-age children in the United States eat fewer fruits and vegetables than are recommended by the Dietary Guidelines for Americans (U.S. Department of Agriculture [USDA] and U.S. Department of Health and Human Services [HHS], 2000). In 1994-96, only 14 percent of school-age children met the target of consuming at least two servings of fruits a day; only 17 percent met the target of consuming at least three servings of vegetables a day (Gleason & Suitor, 2000). Even fewer met the recommended standards for consuming a variety of fruits and vegetables.

The Dietary Guidelines for Americans recommends that all people ages 2 and older choose a wide variety of fruits and vegetables each day because different fruits and vegetables are rich in different nutrients. One target for variety, which is used in the Federal Healthy People 2010 objectives, is an increase in the percentage of children who consume one-third of their

vegetable servings from dark-green or orange vegetables. In 1994-96, only 6 percent of 6- to 19-year-old females and about 5 percent of 6- to 19-year-old males met that goal (HHS, 2001).

One proposed way to improve children's consumption of fruits and vegetables is to increase the number of schools that offer salad bars as part of the National School Lunch Program. A group of policy officials, the National 5-A-Day Partnership, has proposed that all schools have salad bars as a way to increase the number and variety of fruits and vegetables that children consume at school (U.S. General Accounting Office [GAO], 2002).

Our study expanded upon a previous USDA study (Schmidt, Hirschman, & McKinney, 2002) on salad bars that examined whether salad bars were associated with a greater variety of fruits and vegetables being offered in school lunches. It was the first analysis of nationally representative data on

foods offered in school lunch salad bars.

In the interest of presenting a balanced view of salad bars, this study also described items other than fruits and vegetables in salad bars to provide a sense of how often high-fat salad bar ingredients (including regular salad dressing, regular cheese, and mayonnaise-based salads) are offered. Any policy discussion of school lunch salad bars should consider whether these ingredients also could contribute to an increase in children's total dietary fat intake because school-age children consume too much dietary fat. In 1994-96, only 25 percent of school-age children met the Dietary Guidelines for Americans' recommendation of consuming no more than 30 percent of calories from fat (Gleason & Sutor, 2000).

Previous Research

Previous research on the foods offered in salad bars has been limited. One study (Garceau et al., 1997) examined directly the nutrient content of food bars, including salad bars, in 96 elementary schools that participated in an intervention designed to reduce the total fat, saturated fat, and sodium content of school lunches and breakfasts. It found that side salad bars had more total fat than was found in the regular fruit and vegetable components of traditional school lunches. It also found that, compared with the vegetables and fruits served in the regular serving line, side salad bars had similar amounts of saturated fat, vitamin A, iron, and dietary fiber but less calcium and ascorbic acid. One study limitation, however, was that the nutrient analysis was based on assumptions about foods selected from salad bars because data on foods selected were not available. In particular, the results were sensitive to assumptions about

how much salad dressing children placed on salads. The report did not examine which foods were offered, so it did not investigate the issue of fruit and vegetable variety.

Methods

This analysis used data from the School Nutrition Dietary Assessment Study-II (SNDA-II), which was designed to produce national cross-sectional estimates of the nutrient composition of USDA meals served in elementary and secondary schools. The data were collected in late September 1998 to May 1999. The study focused exclusively on public schools, which account for roughly 90 percent of all participants in the National School Lunch Program. The study design included separate nationally representative probability samples of public elementary schools, middle schools,

and high schools participating in the National School Lunch Program (Fox, Crepinsek, Connor, & Battaglia, 2001). Alaskan and Hawaiian schools were not included in the study.

The sample of schools was developed in several steps. First, a stratified random sample of School Food Authorities,¹ which are typically school districts, was selected. To the extent possible, one elementary school, one middle school, and one high school were chosen from each School Food Authority. Finally, the schools in the sample were recruited, and 80 percent of the schools agreed to participate in the study.

¹School Food Authorities are the governing bodies responsible for the administration of one or more schools and have the legal right to operate a National School Lunch Program.

Definitions

Salad bar is a self-serve station where students can select two or more fruits and/or vegetables.

Green salad bars are those in which lettuce is intended to serve as the base of the salad.

Entrée salad bars are green salad bars that include a meat or meat alternate.

Side salad bars are green salad bars that do not include a meat or meat alternate.

Theme salad bars include potato bars, taco salad bars, soup and salad bars, salad and sandwich bars, and potato and salad bars.

“Other” self-serve bars include theme salad bars, fruit bars, and assorted raw vegetable bars.

A serving day for a school is a day on which the school cafeteria serves National School Lunch Program meals. The terms “serving day” and “daily menu” are used interchangeably in this paper.

High-fat items are foods that have more than 38 percent of their calories from fat.

Low-fat items are foods that have no more than 30 percent of calories from fat.

Table 1. Percentage of public schools¹ offering different types of salad bars as part of the National School Lunch Program

Variables	Elementary schools	Middle schools	High schools	All schools
Sample size (number of schools)	385	329	328	1,042
	<i>Percent</i>			
All types of salad bars				
Salad bar of any type daily	10**	20*	32	16
Any type of salad bar at least once per week	14**	26*	41	21
Green salad bars				
Entrée salad bar daily	4**	12*	22	9
Entrée salad bar at least once per week	6**	18*	31	12
Side salad bar daily	6	8	7	7
Side salad bar at least once per week	8	10	10	9
Other salad bars				
Theme salad bar (<i>potato bar or combination salad/sandwich, salad/soup or salad/potato bar</i>) daily	0.3	0	1	0.4
Theme salad bar at least once per week	2	1*	3	2
Self-serve fruit bar daily	2	1	1	2
Self-serve fruit bar at least once per week	2	1	3	2
Self-serve assorted raw vegetables daily	1	1	1	1
Self-serve assorted raw vegetables at least once per week	1	1	1	1

¹ Based on 5-day menu data from SNDA-II.

* Difference, when compared with high schools, is statistically significant at the .05 level.

+ Difference, when compared with middle schools, is statistically significant at the .05 level.

The data analyzed in this study came from a survey of school cafeteria managers, which was collected via mail. Among the schools that agreed to participate in the study, the response rate for the menu survey was 88 percent (Fox et al., 2001). A total of 435 elementary schools, 390 middle schools, and 407 high schools completed the survey. Cafeteria managers were asked to provide detailed information about all foods served as part of the National School Lunch Program during a 5-day period, as well as to provide a description of each item. For the 258 schools with salad bars, respondents were asked to list all ingredients, including salad dressings and toppings. SNDA-II did not collect data on the amount and types of food that children consumed.

The statistical techniques used in this study were relatively straightforward.

The weighted averages and percentages were calculated by using sampling weights that adjusted for nonresponse. The standard errors were adjusted to account for the geographic clustering of schools,² and a 5-percent level of significance was used for statistical significance.

Results and Discussion

Availability of Salad Bars

Sixteen percent of public schools (n=1,042 in fiscal year 1999) participating in the National School Lunch Program offered salad bars daily; 21 percent offered salad bars at least once a week (table 1). School lunch

salad bars were more widely available for children in the higher grades: 41 percent of high schools, compared with 26 percent of middle schools and 14 percent of elementary schools offering some type of salad bar at least once a week. The differences among the three grade levels were statistically significant.

Green salad bars, including entrée salad bars and side salad bars, were the most common forms of salad bars offered by National School Lunch Program schools. Entrée salad bars were present at least once per week in 12 percent of all schools, and side salad bars were offered at least once per week in 9 percent of all schools. Entrée salad bars can be used instead of traditional entrées because these types of salad bars include a meat or meat alternate. The foods in side salad

²The SAS macro program, smsub.sas, was used to calculate the correct standard errors. This program is available at www.SAS.com.

bars count only as fruit or vegetable components of a meal.³

Other types of self-serve bars were offered less frequently in the schools offering the National School Lunch Program. Two percent of all the schools offered theme salad bars at least once a week, 2 percent offered self-serve fruit bars, and 1 percent offered self-serve raw vegetables at least once a week. Theme bars count as entrées; whereas, fruit bars and assorted self-serve raw vegetables count as the fruit or vegetable component of the meal. For the remainder of this paper, schools with salad bars are defined as those that offer any type of salad bar at least once per week.

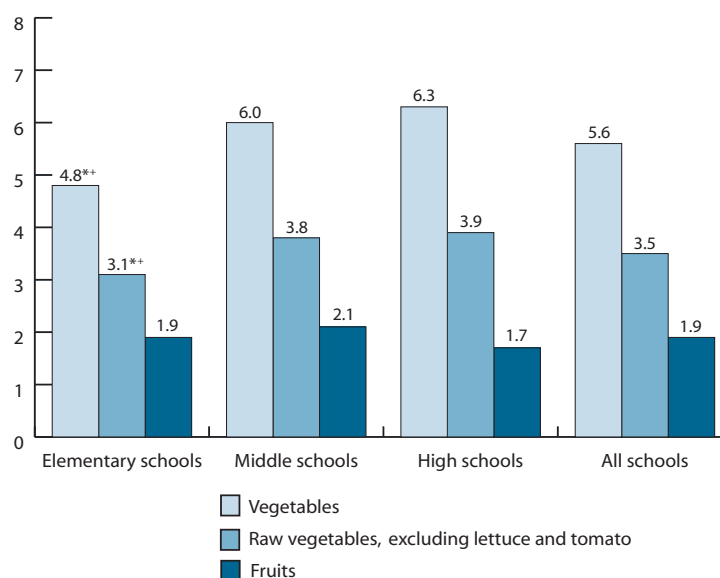
The Variety of Fruits and Vegetables Offered by Schools With Salad Bars and Without Salad Bars

On average, the typical high school salad bar offered a variety of vegetables (6.3) and fruits (1.7) (fig. 1). In particular, high school salad bars included a wide variety of raw vegetables (3.9 on average) other than lettuce or tomato. The results for middle schools were similar. Elementary schools offered significantly fewer vegetables on their salad bars than did middle or high schools, with an average of 4.8 vegetables and 3.1 raw vegetables other than lettuce and tomatoes.

The remainder of the paper focuses on findings for high school salad bars

³To count as a reimbursable traditional meal of the National School Lunch Program, a lunch must include a meat or meat alternate, grain or bread, a fruit or vegetable, and milk. However, students in high schools and some middle and elementary schools may choose three of the five food items under the Offer versus Serve option.

Figure 1. Mean number of fruits and vegetables offered in salad bars, by Grade level



*Difference, when compared with high schools, is statistically significant at the .05 level.

**Difference, when compared with middle schools, is statistically significant at the .05 level.

because they are the most common.⁴ With a few exceptions, the results for middle schools and elementary schools are qualitatively similar to those for high schools.

Categories of Vegetables and Fruits Offered by High Schools

High schools with salad bars offered a greater variety of vegetables and fruits than did schools without salad bars. The analysis focused on fruits and vegetables served both in the salad bar and in the traditional serving line; in schools with salad bars, the analysis

focused on both serving days with and without salad bars on the menu. The most striking results were for lettuce, raw tomato, and other raw vegetables, which were offered on 91, 73, and 87 percent of serving days, respectively, in high schools with salad bars (table 2). In schools without salad bars, lettuce, raw tomato, and other raw vegetables were significantly less common, being offered on 49, 13, and 15 percent of serving days, respectively. (The results for lettuce and raw tomato are shown because traditional serving lines frequently offer lettuce and raw tomatoes in green salads or as sandwich toppings.⁵)

⁴Statistics comparing schools at all Grade levels with and without salad bars can be misleading. Elementary schools comprise a disproportionate share of schools without salad bars, and high schools comprise a disproportionate share of schools with salad bars. Therefore, differences in food offerings among schools at all Grade levels with and without salad bars are partly driven by the fact that high schools tend to offer different types of fruits and vegetables than do elementary schools, regardless of whether the schools have salad bars.

⁵High schools without salad bars offered chef's salads or green side salads more frequently than did schools with salad bars. Chef's salads, which count as an entrée because they include meat or meat alternates, were served on 8 percent of serving days in schools with salad bars and 21 percent of serving days in schools without salad bars. Green side salads were offered in schools with salad bars on 18 percent of serving days and 29 percent of serving days in schools without salad bars.

Table 2. Percentage of daily menu items either in salad bar or regular serving line of public schools offering the National School Lunch Program

Categories of fruits and vegetables served	High schools		All Grade levels	
	With salad bars	Without salad bars	With salad bars	Without salad bars
Sample size (number of schools)	118	210	258	784
	<i>Percent</i>			
Vegetables				
Lettuce	91*	49	89*	35
Tomato, raw	73*	13	64*	7
Raw vegetables, excluding lettuce and tomato	87*	15	84*	16
Cooked vegetables	61*	45	49	44
Legumes	18*	9	13*	7
Other (non-green) salads	30*	8	19*	7
Fruits				
Canned	74*	53	73*	56
Fresh	70*	50	69*	42
Dried	7*	1	12*	1
Frozen	6	4	8	7

Notes: Green salads or salad bars with multiple vegetables are categorized in multiple rows.

Based on 5-day menu data from SNDA-II.

*Difference in those schools with and without salad bars is statistically significant at the .05 level.

Students in schools with salad bars need to select foods from the salad bar to take advantage of the wider variety of fruit and vegetable offerings in their school cafeterias, because schools with salad bars do *not* serve a greater variety of fruits and vegetables in their regular serving lines.

In addition, cooked vegetables, legumes, and non-green vegetable salads were significantly more common in high schools with salad bars than in high schools without salad bars.

High schools with salad bars also offered a significantly greater variety of fruits than did high schools without salad bars. On 74 and 70 percent of serving days, high schools with salad bars offered canned and fresh fruit, respectively, compared with 53 and 50 percent of serving days, respectively, in high schools without salad bars. Dried fruit was also more common in high schools with salad bars than in high schools without salad bars: 7 percent versus 1 percent of serving days.

Students in schools with salad bars need to select foods from the salad bar to take advantage of the wider variety

of fruit and vegetable offerings in their school cafeterias, because schools with salad bars do *not* serve a greater variety of fruits and vegetables in their regular serving lines. All of the statistically significant differences in fruit and vegetable category offerings among schools with and without salad bars are due to the greater prevalence of fruits and vegetables in salad bars.⁶

Individual Nutrient-Dense Vegetables

Certain nutrient-dense vegetables were much more common in salad bars than in traditional serving lines (fig. 2), and these differences were statistically significant. Carrots, rich in vitamin A, were offered in either raw or cooked form on 70 percent of serving days in high schools with salad bars. Broccoli, which is rich in calcium and vitamin C,

⁶Tables that illustrate this finding are available upon request from the primary author.

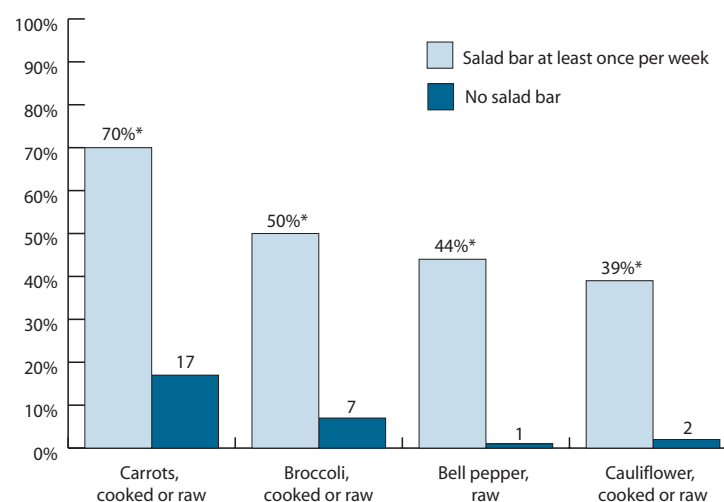
was offered in either raw or cooked form on half of the serving days in high schools with salad bars. In contrast, high schools without salad bars served carrots on 17 percent of serving days; and broccoli, on 7 percent of serving days. Carrots and broccoli are the only orange and dark-green vegetables commonly served in school lunches. Other types of orange and dark-green vegetables, including sweet potatoes, pumpkin, spinach, and other greens, were rarely offered in school lunches—less than 1 percent of daily menus in schools with and without salad bars.

Similar to broccoli, cauliflower, a cruciferous vegetable rich in vitamin C, was offered more widely in high school lunch salad bars than in traditional serving lines. Cruciferous vegetables may play a role in reducing the risk of cancer (National Research Council, 1989). Cauliflower was served on 39 percent of serving days in high schools with salad bars, but on only 2 percent of serving days in high schools without salad bars. Another vitamin-C rich vegetable, bell pepper, was offered on 44 percent of serving days in high schools with salad bars, but rarely appeared (1 percent of serving days) in the lunch menus of high schools without salad bars.

Other Items on Salad Bars

To provide a more balanced view of school lunch salad bars, we now present a description of the items other than fruits and vegetables offered in salad bars. Public discussions of the benefits of school lunch salad bars typically focus on achieving the goal of increased vegetable and fruit consumption. But another important dietary goal is reducing children's fat consumption, because only one-quarter of children meet the recommendation of the 2000 Dietary Guidelines for Americans that children should consume no more than 30 percent of their calories from dietary fat

Figure 2. Percentage of high school daily menus that include certain nutrient-dense vegetables



*Difference, when compared with high schools without salad bars, is statistically significant at the .05 level.

(Gleason & Suitor, 2000). In 1995, USDA launched the School Meals Initiative for Healthy Children (Initiative), which was designed to improve the nutritional quality of school meals. The Initiative requires that school menus comply with the Dietary Guidelines for Americans' recommendations for fat.

On those days when high schools offered salad bars, salad dressing, offered on 95 percent of salad bar serving days, was the most common non-fruit or non-vegetable offering in high school salad bars (table 3). Regular salad dressing was offered on 66 percent of these serving days, and either low-fat or fat-free salad dressing was offered on 67 percent of serving days. On about 28 percent of serving days, regular salad dressing was offered but low-fat or fat-free salad dressings were not.⁷

⁷ The figure of 28 percent is obtained by subtracting the percentage of serving days in which low-fat or fat-free salad dressings were offered (67 percent) from the percentage of serving days in which any type of salad dressing was offered (95 percent).

Salad bars typically include one or more high-fat items in addition to salad dressing. The most common high-fat item was regular cheese, which was offered on 61 percent of high school salad bar serving days. Regular cheese was much more common than was reduced-fat cheese, which was offered on only 22 percent of salad bar serving days. Similarly, meat and pasta salads made with regular mayonnaise or salad dressing were more commonly offered than were their low-fat versions. High-fat meat or pasta salads were offered on 26 percent of salad bar serving days; whereas, their low-fat meat or pasta salads were offered on 7 percent of salad bar serving days. Other common high-fat items offered on salad bar serving days were hard-boiled eggs and bacon bits (21 and 34 percent of serving days, respectively).

Some low-fat meat or meat alternates, grains, and toppings were commonly offered on salad bars. The most common low-fat item such as turkey, water-packed tuna, chicken, or ham, was served on 56 percent of salad bar

Table 3. Percentage of salad bar serving days in which other selected items were offered in public schools with salad bars, as part of the National School Lunch Program

	High schools	All Grades
Any salad dressing	95	94
Regular	66	72
Low-fat or fat-free	67	60
Low-fat	49	44
Fat-free	33	26
Selected high-fat meat or meat alternates or toppings		
Regular cheese	61	52
Bacon bits	34	28
Hard-boiled eggs	21	22
Meat or pasta salad with regular mayonnaise or salad dressing (<i>tuna salad, chicken salad, macaroni salad</i>)	26	17
Sunflower seeds	8	10
Olives	16	10
High-fat meat (<i>pepperoni, breaded chicken, beef, etc.</i>)	8	5
Creamed cottage cheese	10	5
Selected reduced-fat meat or meat alternates or toppings		
Reduced-fat cheese	22	13
Selected low-fat meat or meat alternates or toppings		
Low-fat meats (<i>turkey, water-packed tuna, chicken, ham, etc.</i>)	56	43
2% or 1% cottage cheese	17	12
Meat or pasta salad with low-fat mayonnaise or salad dressing (<i>tuna salad, chicken salad, macaroni salad, etc.</i>)	7	3

Note: Based on 5-day menu data from SNDA-II.

serving days.⁸ Two-percent or one-percent cottage cheese was also relatively common, being offered on 17 percent of salad bar serving days.

Depending on what children select and consume, the high-fat items could be a significant source of added fat and calories in salad bar meals (Flowers-Willems, McNaughton, Levine, & Ammerman, 1985). For example, analyses of the USDA's 1994-96 Continuing Survey of Food Intakes by Individuals (CSFII) have shown that for a significant minority of children, serving sizes of salad dressing are

fairly large (Smicklas-Wright et al., 2002). At the 75th percentile of quantity consumed per eating occasion, 12- to 19-year-old males and females consumed about 4 tablespoons of salad dressing. For blue cheese salad dressing, that translates into 30 grams of total fat, which is more dietary fat (26 grams) than the average National School Lunch Program meal in schools without salad bars (Schmidt, Hirschman, & McKinney, 2002; USDA, 2004). The typical child eating a salad bar lunch probably consumes a more modest serving of salad dressing, since the median serving size of salad dressing, reported in the CSFII, for 12- to 19-year-olds was 2 tablespoons for females and 2-1/3 tablespoons for males (Smicklas-Wright et al., 2002).

⁸ More detailed tables on meat and meat alternates, grains, and toppings on salad bars are available from the first author upon request.

Conclusions

This analysis has focused on the foods *offered* in salad bars. In schools with salad bars, students have the opportunity to choose from a wider range of fruits and vegetables, including lettuce, tomato, other raw vegetables, fresh fruit, and canned fruit. In particular, salad bars are the best source of orange and dark-green vegetables in school lunches, because salad bars commonly offer carrots and broccoli.

The School Nutrition Dietary Assessment-II (SNDA), from which our data were derived, has several limitations. The study did not collect data on the quantity of foods that school children consumed. To understand whether the more widespread adoption of salad bars would improve dietary quality, one would need to know what school-children eat from salad bars. If students select lettuce, tomato, other raw vegetables, fresh fruit, low-fat or fat-free dressings, and low-fat meats, their salad bar meal could have a greater variety of fruits and vegetables and be lower in dietary fat than would be the case for a typical meal from the National School Lunch Program. If students choose to load their salads with regular salad dressing, regular cheese, bacon bits, or mayonnaise-based salads, then their salad bar meal could actually be higher in total fat than found in the average meal from the National School Lunch Program. Future research on what students *select* and *consume* from school lunch offerings is needed to examine the implications of the wider availability of salad bars in more schools.

Another limitation is that SNDA-II did not collect detailed ingredient information on non-salad bar items (in the traditional serving line) that contained more than one ingredient. For example, green salads were

frequently offered in the traditional serving line, but no information was available on whether carrots or broccoli was offered. The SNDA-II did collect information on the nutritional composition of foods offered in the traditional serving line.

We analyzed the nutrient composition of green side salads and chef's salads, and our results suggested that vitamin A- and vitamin C-rich vegetables appeared relatively infrequently in green salads served in the traditional serving line. In particular, only 3 percent of chef's salads and green side salads were a good source of vitamin C (i.e., greater than 20 percent of the Recommended Daily Allowance); 27 percent of chef's salads and 20 percent of green side salads were a good source of vitamin A. If one assumed that all of the vitamin A-rich chef's salads and green side salads contained carrots, which is the most common vitamin A-rich vegetable in school lunch salads, our analysis would still show that carrots were served much more frequently in schools with salad bars than was the case in schools without salad bars.

Another limitation is that data are not available on fruits and vegetables that are included as part of entrées other than entrée salad bars and theme bars. For example, tomato sauce topping for pasta would not be counted as a tomato in our analysis examining whether tomatoes appeared more frequently in schools with salad bars, even though that tomato sauce would count as at least part of a serving of vegetables in the USDA Food Guide Pyramid.

Despite these caveats, our study suggests two types of policies that might increase children's fruit and vegetable consumption while maintaining or reducing dietary fat consumption. The first policy would be to encourage schools with salad bars

to continue to offer a wide variety of fruits and vegetables and low-fat meats and to change their offerings to include more low-fat or fat-free salad dressings, reduced-fat cheese, and low-fat versions of meat or pasta salads. In addition, another policy might be to improve nutrition education, as well as the palatability and appearance of salad bar meals so that children in schools with salad bars choose salad bars rather than the traditional serving line. In schools with salad bars, children get the benefit of increased fruit and vegetable offerings only if they choose the salad bar.

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